

# Intumescent

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An **intumescent** is a substance which swells as a result of heat exposure, thus increasing in volume, and decreasing in density. Intumescent are typically used in passive fire protection and require bounding installations in order to comply with the law.

In Europe the local building controls often require the use of such seals to close paths through which otherwise fire may spread. In the UK, for example, approved document B (<http://www.planningportal.gov.uk/england/professionals/en/1115314110382.html>) ('Building regs -fire safety ' ) allows intumescent seals on plastic pipes or vents that pass through a shared brick wallbetween an attached garage and a dwelling, as an alternative to lining or boxing over the pipes with a fire proof boarding. Similarly exposed structural steels in high risk zones, like garages, may be finished with intumescent paint, or fully clad to achieve the necessary fire rating. Similar rules govern openings, service tunnels, and and pipes, that pass between apartments in a block, or through fire escape stairwells.

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## Types of intumescent

### Soft char producers

These intumescent produce a light char, which is a poor conductor of heat, thus retarding heat transfer. Typically, these materials also contain a significant amount of hydrates. As the hydrates are spent, water vapour is released, which has a cooling effect. Once the water is spent, it is only the insulation characteristics of the char that was produced, which can slow down heat transfer from the exposed side to the unexposed side of an assembly. Soft char producers are typically used in thin film intumescent for fireproofing of structural steel as well as firestop pillows. Typically, the expansion pressure that is created for these products is very low, because the soft carbonaceous char has little substance, which is beneficial if the aim is to produce a layer of insulation.

### Hard expanding char producers

Harder chars are produced with sodium silicates and graphite. These products are suitable for use in plastic pipe firestops as well as exterior steel fireproofing. In those applications, it is necessary to produce a more substantial char, with a quantifiable expansion pressure. In the case of the firestops, a melting, burning plastic pipe must be squeezed together and shut so that there will be no hole for fire to

go through an opening in an otherwise fire-resistance rated wall or floor assembly. In the case of the exterior fireproofing, a hydrocarbon fire must be held off with quite potentially more kinetic energy than a house fire. Intumescent materials that produce hard chars are not typically used for interior spray fireproofing as they are not suitable for that application.

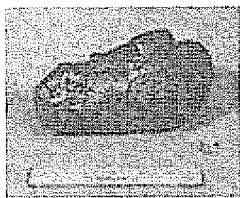
## Uses of intumescent in passive fire protection

Intumescent materials are used in firestopping, fireproofing and gasketing applications, in buildings, offshore construction, ships, and aircraft.

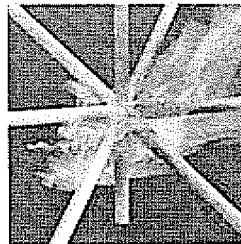
## Problems with intumescent

Some intumescent materials are susceptible to environmental influences such as humidity, which can reduce or negate their ability to function. DIBt approvals quantify the ability of intumescent materials to stand the test of time against various environmental exposures. DIBt approved firestops and fireproofing materials are available in Canada and the US.<sup>[1]</sup>

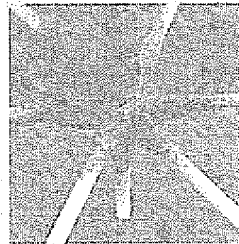
## Gallery



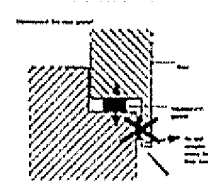
**Low Pressure Intumescent Resin:** This product is suitable for use in passive fire protection in general, firestopping and interior fireproofing in particular. The small, orange chunk on the bottom right hand side is capable of growing into that large black shape. This type of intumescent is typically highly endothermic. It contains a lot of chemically bound water, in hydrates. As this is released, it cools adjacent materials. Such intumescent materials are useful



Pipes covered with a thin-film intumescent spray fireproofing product called unitherm. As the flame from the blow-torch is applied, the intumescent sodium silicate expands, forming a layer of insulation, which slows down heat transfer to the pipe below. Hydrates within the coating give up their water content, maintaining a temperature near the boiling point of 100°C. The critical steel temperature is ca. 540°C. Once the water is



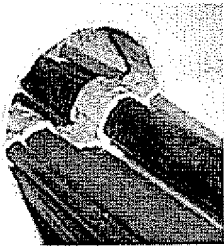
In this picture, the flame has been removed after the thin-film intumescent spray fireproofing product has been completely expanded. Some intumescent materials can undergo shrinkage shortly after full expansion has taken place. The important thing to remember, however, is the need for bounding of the installed configuration.



**Intumescent gasketing** used in passive fire protection, for fire door applications. Typically, such gasketing is needed to pass positive pressure furnace testing, a recent change in North America.

as ingredients in firestop pillows and in paints, which are used for fireproofing purposes. These intumescent do not produce enough expansion force to be used in plastic pipe devices, where the intumescent must squeeze a melting plastic pipe or conduit shut.

spent and enough heat has gone through the char, the steel can reach and exceed its critical temperature and then lose its strength. The time this takes determines the fire-resistance rating.



**Intumescent** putty, permanently pliable, used in a cable penetration firestop. Permanently pliable putties are similar in consistency to play-dough used for children's toys. Putties of this nature also lend themselves to be used as pads to cover electrical outlet boxes inside drywall assemblies required to have a fire-resistance rating. The endothermic and insulative action of the pads reduce thermal transfer through the metallic outlet box to the unexposed side of the rated drywall assembly. All intumescent must be installed in a manner

A passive fire protection example of an intumescent with strong expansion pressure. This intumescent is called Palusol. It is based on waterproofed sodium silicate. Another high-expansion intumescent popular for use in plastic pipe firestop devices is graphite. Graphite tends to be less affected by atmospheric conditions than many water-bearing intumescent.

Construction of a test sample, consisting of a mock-up concrete floor frame, complete with penetrants. The concrete frame measures approximately 5' x 9' x 4" (ca. 1.5m x 2.3m x 10cm). It has a large hole in the centre with many mechanical and electrical services traversing. The penetrants extend 1' (30cm) into the furnace and 3' (91cm) on the unexposed side. A firestop mortar is being applied here. Notice the **intumescent** wrap strip surrounding the fibreglass pipe insulation. When the fire starts, this embedded intumescent will swell to take up the

consistent with  
bounding requirements.

place of the melting  
insulation. The test was  
conducted in  
accordance with the  
Canadian firestop test  
method ULC in  
Scarborough, Ontario.  
[2]

## References

- <sup>↑</sup> <http://www.dibt.de/>
- <sup>↑</sup> [http://www.ulc.ca/\]S-115](http://www.ulc.ca/]S-115)

## See also

- Fire test
- Fire-resistance rating
- Hydrate
- Fire protection
- Passive fire protection
- Firestops
- Putty
- Fireproofing
- Firestop pillow
- Endothermic
- Sodium silicate
- Graphite
- Penetrant
- Bounding
- Construction

## External links

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